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VALIDATION OF THE 1975 POLICE SERVICES EXAMINATION FOR THE COMMONWEALTH OF MASSACHUSETTS

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ABSTRACT

This study evaluates the job relatedness of the Police Services Examination given in Massachusetts in October 1975. A predictive criterion-related validity methodology was employed, with the written examination grade as the predictor and performance in Police Academy training as the criterion. Descriptive statistics for the applicant population of over 20,000 persons and the smaller validation sample (n=376) are reported. The written examination was found to be highly predictive of the academy grade: unadjusted correlation coefficient $r=.49$, $p < .001$; adjusted $r=.71$, $p < .001$. This high degree of prediction, considered with the selection ratio and success ratio, indicates that the 1975 Police Services Examination has a high degree of utility as a selection device.

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FOREWORD

This report has been in existence in draft form for several years. It has been edited and published at this time as part of our ongoing effort to develop and document improved public safety examinations. Some of the references cited in this report are dated. This is due to the delayed publication of the report. Aside from this purpose, this report is intended to serve a heuristic purpose, and therefore has more detail in some areas than would otherwise be appropriate.

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Introduction

1.1 Background

In June of 1975 a statewide examination for Police Officer was administered to over 22,000 applicants. A large number of the cities and towns rely upon an eligibility list, established by this statewide Civil Service written examination, to provide a pool of candidates from which to make appointments to their police forces. As in other states, this practice has a history of over one hundred years, originating as a paradigm developed by State and Federal Civil Service reformers in the 1880's as the means of taking "politics out of Civil Service and Civil Service out of politics" (Rosenblum & Oluchowski, 1977, p.9). Competitive merit examinations were the means by which the Civil Service was to be expunged of nepotism, cronism, and favoritism by establishing an avenue by which only those of superior ability would be appointed. The merit system became the cornerstone of public personnel administration; and in the area of entry level positions, written examinations became the cornerstone of the merit system. In order for the merit system to legitimately select personnel by reason of written tests, a high mark on the test must be a valid indicator of the possession of qualities which would allow successful performance on the job.

The questions of legitimacy and validity arose in relation to the entry level Police Officer Examinations administered by the Civil Service Division of Massachusetts in 1968 and 1970. A class action suit was brought against the Commission and the Boston Police Department in which the plaintiffs, Castro et al., charged that those particular exams (1968-1970) were discriminatory and not job-related. The finding of the U.S. Court of Appeals for the first Circuit stipulated that "the public employer must, we think, in order to justify the use of a means of selection (the written exam), shown to have a racially disproportionate impact, demonstrate that the means is in fact substantially related to job performance. It may not, to state the matter another way, rely on any reasonable version of the facts, but must come forward with convincing facts establishing a fit between the qualifications and the job" (Castro vs. Beecher 459 F2d 725 (1st Civ, 1972) p.11). Under this directive of the Court, the Division of Personnel Administration, which currently administers the Civil Service Police Entrance Examinations, is required to substantiate that any written examination it uses for the purpose of establishing eligibility lists be a valid indicator of qualities necessary for performing the actual duties of a Police Officer; face validity was deemed inadequate.

The court deemed the practice of employing tests which have adverse impact on minorities and whose "job relatedness" is undemonstrated, as a discriminatory practice, unless or until it meets the condition of substantiated job relatedness.

The final judgement in this case (April, 1973) required that written examinations for police officer be validated in accordance with the testing guidelines of the Equal Employment Opportunity Commission. This report presents a criterion related validity study in compliance with that requirement.

1.2 Validity Concepts

In the area of testing, particularly for personnel selection, two issues are of prime concern: the reliability and the validity of the selection instrument.

Reliability refers to the consistency of scores for individuals. For example, would persons score substantially the same if they were to take a similar test. The validity of a test refers to whether the test measures what it purports to measure. We can identify three overlapping approaches to validation:

Content validity involves examining the test to determine whether the total test truly and fairly represents the knowledges and abilities purported to be measured. This type of validation is often used for achievement (knowledge) tests, tests which measure how well an individual has mastered a certain body of knowledge. The total set of knowledge is first determined or described. A test is then content valid if its items are a good sample of the total set.

Construct validity refers to the extent to which a test measures a theoretical construct or trait; examples include intelligence, creativity and extroversion. Aptitude tests may also fall into this category. Construct validity depends upon the gradual accumulation over time, and in different situation, of information on the nature of the construct and the conditions which affect its development.

Criterion-related validity refers to the comparison of the test to a criterion, i.e. a direct measure of what the test is supposed to predict. The American Psychological Association's Test Standards (1974) differentiate between two methods of criterion related validity, concurrent and predictive, based largely on the time interval between the collection of the predictor variable (the test) and the criterion variable. In a concurrent validation study the test is administered to a sample of incumbents, while the criterion information is measured concurrently (e.g. job performance of presently employed police patrolmen). Statistical analysis is performed to determine how well the test presently predicts this criterion.

In predictive validation, the test is typically administered to an applicant group. If there is a group of applicants for a position, selection for that position is ideally made without regard to their scores on the test. At a future time the criterion information is gathered on a sample of the selectees, and the relationship between the test scores and the criterion is determined. In many cases, the best method to use in personnel selection, when feasible, is predictive criterion-related validity.

Due to the nature of the job of Police Officer, however, and the severe consequences of hiring an unqualified officer, it is not desirable to hire applicants without regard to qualifications. A practical approach to conducting a predictive validity study is to use the test for selection purposes, then collect criterion information on those selected and validate the test using this data. While this method is economically practical it gives rise to a statistical problem: restriction of range. This problem does have a statistical solution which will be dealt with in a later section.

1.3 The Criterion

The heart of any predictive validity study is the criterion. Many different measures are possible, among these are: ratings of job performance and performance in training, and objective criteria, such as attendance punctuality, conviction rate, and disciplinary action.

1.3 The Criterion

The use of job performance as a criterion entails the use of raters or some other measurement method to judge the performance of the hires. Not only is this procedure expensive, but also rater bias and problems with inter-rater reability can depress the magnitude and confuse the interpretation of any validation evidence obtained. Further confounding job performance as a criterion is the diversity of jobs and the setting in which a policeman can be placed. These could range, for example, from traffic work to investigation, from slum areas to areas of high socio-economic status, or from urban to rural areas. Thus diversity and room for error increases as one moves from people taking the same test to people undergoing similar but not identical training to people assigned to diverse jobs. In a study by the City of Phoenix (1975), using an entry level police examination in a predictive validity study, a strong relationship was found between test scores and training on the one hand (r=55) and a relatively weaker relationship between training scores and job success on the other hand (r=0.30). It seems reasonable here, and indeed is standard practice in other areas (e.g. Armed Forces), to accept training data as a suitable substitute for job performance in a predictive validity study.

1.4 Reliability

A necessary but not sufficient characteristic of a valid test is a high degree of reliability: "a test can be reliable without being valid, but it cannot be valid without being reliable" (Phillips, 1973, p. 48). The concept of reliability could be compared to the scores on a pistol range target. If one assumes the marksman is a good shot, then the accuracy of the pistol itself is analogous to reliability while the accuracy of the sight is analogous to validity. If the pistol is inaccurate, it does not matter how good the sight is, the shots will be spread all over the target. If the pistol is accurate, the shots should end up in a tight group. However, if the sight is off, this tight group will be off the bullseye. Only if the pistol is accurate can one determine whether or not the sight is accurate. In testing, only if a test is reliable can it be "on target", that is, valid.

A reliable test puts scores in a tight group and a valid test means that the scores will be true indicators of performance. High reliability reduces the probability that the scores are due to chance or luck, and increases the probability that the scores are due to skill. It is obviously always important to have a test of high reliability.

1.5 Other Studies

A number of other studies have been done to validate entry level police examinations, some with the same form as the test used in this study (developed by the International Personnel Management Association, IPMA , Police Officer Form A1). The California Selection Consulting Center (CSCC, 1973) conducted a concurrent validity study using the IPMA Form A1, and determined that the test was valid in predicting the present performance of officers on the job. The Educational Testing Service (ETS, 1976) performed a concurrent validation study in four jurisdictions on a preliminary test which was developed based on a job analysis. The ETS Study found positive correlations on all abilities tested for one or more job dimensions. A concurrent validation study conducted for the City of Philadelphia by the Center for Occupational and Professional Assessment (1974) found their own entry level police examination, developed by the City of Philadelphia, to be valid.

The present study evaluates the predictive validity of the 1975 entry level police examination (IPMA J:A1) for the Commonwealth of Massachusetts using as the criterion training data from police academics for those applicants selected. The study takes into account factors which might systematically affect the relationship between test scores and academy grades, and makes an assessment of the practical utility of the examination.

METHODOLOGY

2.1 Predictor

The selection of a test to serve as predictive instrument is governed by several factors. Since the written test will have the function of predicting the adequate and/or superior job performance as a Police Officer, it is important to take steps to ensure job-related test content. These procedural steps are outlined in the psychological literature.

The foundation of a written test constructed as a predictive instrument is laid by conducting a job analysis of the position. Areas on the test are selected for their relation to those tasks or knowledges, skills, abilities or personal characteristics identified by the job analysis.

For the 1975 test, the Division of Personnel Administration researched the existing literature and selected the International Personnel Management Association's Police Officer J:A-1 (M). The IPMA Form A-1 (M) test contains five sub-tests:

Sub-Test	Subject	No. of Questions
I	Verbal Ability	25
II	Number Series	5
III	Table Interpretation	6
IV	Interpretation of Hypothetical Rules and Regulations	15
V	Reading Comprehension	20
	Total=	71

The California Selection Consulting Center performed a concurrent validation study with the IPMA J:A1 as the test instrument and job performance evaluation as the criterion. This study found that "... the IPMA J:A1 examination (is) significantly correlated with 'major, critical and important' elements of job success for entry-level law enforcement positions" (Selection Consulting Center, 1973, p. 53).

The results of a job analysis performed by Bio-Dynamics Inc., Research Division in January of 1972 on the Police Officer positions in Massachusetts identified the elements of "reading comprehension, powers of observation, and analytical ability" as items which "... should be included as test items in the written examination." (Bio-Dynamics, 1972, p. 10).

In part as a result of these similarities, sufficient documentation was thought available to justify applying the results of the California/Nevada Study to the Police Officer function in Massachusetts in accordance with E.E.O.C. Guideline 1607.7. This validity generalization served as the basis of test selection. Precise estimation of the validity of the IPMA Form A1 as a predictive job-related instrument for Massachusetts' Police Officer position awaits the results of the present criterion-related predictive validity study.

The actual administration of the 1975 Entry Level Police Officer Examination was conducted in the classrooms of selected public schools in the following cities: Boston, New Bedford, Lowell, Lawrence, Worcester, Springfield, and Pittsfield. Other cities and towns were added as required by the distribution of the applicant group throughout the state. Each of the classrooms had a monitor who was responsible for giving the directions for taking the exam, assuring the integrity of the testees' performance and collecting additional data from the testees, such as fingerprints, application forms and proof of birth date. The English language version of the exam had two parts. Part I, 1.5 hours in length, Part 2, 45 minutes in length. Applicants were not allowed to leave the classroom for any reason during the entire administration. Part I consisted of the IPMA Police Officer J:A1; Part 2 was a test given for research purposes only and later discarded. Each classroom monitor was provided with instructions for allowing applicants to take the examination in Spanish if they so desired. Thse applicants taking the Spanish exam, in addition to the 1.5 hour and the 45 minute sections of the Entry Level Police Officer Examination, were required to take a Reading Test of 40 minutes in length which measured their reading proficiency in English. Only a handful of applicants chose to take the exam in Spanish. Data from these applicants is not considered below.

The Division of Personnel Administration's Examination Bureau scored the October, 1975 administration of the IPMA J:A1 by using an optical scan answer sheet reader with a mark sense answer sheet. The Administration and Finance Computing Center generated the frequency of occurrence of the percentaged scores. In accordance with state law the "passing score", the score that an applicant would have to receive in order to be included on the eligible list, was established at 61%. The examination scores of the entire applicant group were then separated into categories: males, female, Black, White, and Spanish-Surnamed, and for each of these groups the frequency, score, mean, standard deviation, and variance were compiled (Division of Personnel Administration press release issued on July 9, 1976.)

The original scoring generated the examination data in a form which prevented calculation of sub-scores. The present study rescored the original examination answer sheets, in order to obtain each applicant's total score and scores on the five sub-tests. The descriptive statistics of interest include the examination raw scores for each applicant, the mean and standard deviation for the entire population, and for subsamples of Black, White, Spanish-Surnamed, male and female applicants.

Descriptive statistics for each of these subsamples will be compared to the population parameters, and similarities and differences will be noted. In this fashion the general performance of identifiable minority groups will be derived and allow intergroup comparisons.

The Kuder-Richardson method of determining inter-item consistency will be used to index the relability of the IPMA J:Al. This method will be employed on the test as a whole and upon each of the sub-tests where it would yield adequate results.

2.2 Criterion

The IPMA J:Al was used by the Division of Personnel Administration in October of 1975 as a means of determining aptitude for the entry level police position. Implicit in the test's use was the concept that a certain standard of performance on the test would indicate whether an individual would make a qualified police officer. Based on validity and validity generalization evidence, it was thought that adequate performance on the test demonstrated the qualities required to become a good police officer. Demonstrating the worth of this assumption entails evaluating the validity of the test. For the test to have high validity, test performance must have a positive correlation with a measure of success as a policeman. Job performance (i.e. a successful police career) is the ultimate measure, for only when a person has shown capability on the actual job is ultimate success demonstrated.

Another acceptable method to use to validate a test such as the IPMA J:A-1, is a comparison between test performance and training records. A classic example of this type of criterion validation is the Air Force pilot selection test's comparison against basic flight training performance (Anatasi, 1976).

Each of these two methods has advantages and disadvantages. Job performance has a long maturation period, especially in Massachusetts. Two years might pass from the date of examination to date of appointment to a police force. Several more years might pass prior to consideration for any type of promotion. Rater bias also seems to be a disadvantage of job performance ratings since they require judgement of supervisors who might be subject to influences other than purely job performance. Even with the use of trained raters the potential problem remains. The greatest advantage of job performance is that it need not be compared against another criterion, since it is the desired result.

Advantages to using training as the criterion include: a shorter maturation time, an objective and coherent data set, especially if the curriculum is standardized. If the curriculum is standardized, final grades are then a result of demonstrated performance in defined areas. Further, in Massachusetts, those people receiving permanent appointments from cities and towns subscribing to the state Civil Service system are required by law to attend one of the certified police training academies operating within the state. Academy training provides an element of commonality for those appointed to the various police forces and reinforces its use as a criterion in a predictive study. A drawback of training as a criterion is that it is one step removed from job performance.

Beyond this strong general support for the use of training data as a criterion, there is an unpublished study (Gannon, 1978) conducted in Massachusetts which shows that level of performance in the training academy programs is related to level of performance on the job. For these reasons, the decision was made to use the more coherent training data as the criterion in this study rather than job performance.

The State Police and the Metropolitan District Commission Academies, as well as academies in nine cities and towns, whose Police Departments operated training courses within the months following establishment of the 1975 eligible list, were contacted and their cooperation with this study was solicited and received.

There are two areas where "contamination" has traditionally been considered possible in criterion development: tenure and prior knowledge of the predictor results by those involved in criterion ratings. Some assurance must be had that those involved in evaluating criterion performance, in this case police academy training instructors, do not know the scores which individuals in their class received on the entrance examination. Such knowledged tends to influence the grading of criterion performance (Anatasi, 1976). The question of contamination by a prior knowledge of predictor results was investigated. The Massachusetts Criminal Justice Training Council, responsible for the coordination of training in the state, provided information on the type of data with which newly appointed candidates arrive at the academies. This data does not contain the grade received by the candidate on the examination. It seems that this aspect of criterion contamination is not a consideration for further pursuit.

Tenure, as it is meant here, refers to the amount of experience a candidate would accumulate on the job before attending an academy. Since not all candidates were academy trained immediately after appointment, those having on-the-job experience might be in a position of unfair advantage in academy training and affect the resulting correlations. This matter of tenure does not seem to factor into this study. Since it is a matter of legal necessity that a new appointee must attend and successfully complete academy training within a year of being appointed, the longest time this allows for on-the-job training is nine months. Other validation studies considering the topic have not considered on-the-job training a significant influence unless it was a period greater than three years. It would have been relatively easy to examine these assumptions during the course of analysis, however, due to the Fair Information Practices Act and the constraint of anonymity placed upon information gathering by the Massachusetts Criminal Justice Training Council's interpretation of this Act, this type of information was lost in the coding procedure.

2.3 Validation Procedure

2.3.1 Correlation Coefficient

The basic statistic used to measure validity is the Pearson product-moment correlation coefficient. Unless otherwise stated correlation will mean Pearson correlation. This statistic has found widespread use in many different fields. The correlation coefficient is an index of the degree of linear association between two variables, in this case the examination score, or subscore, and the police academy grade. The correlation can range between +1.00 and -1.00. The sign of the coefficient indicates whether, when the first variable increases, the second variable increases (positive correlation) or decreases (negative correlation). The greater the magnitude of the coefficient, i.e. the closer to plus or minus 1.00, the greater the degree of association. Thus correlations of -0.90 or +0.90 indicate a very high degree of association, the former in a negative direction and the latter in a positive direction. Correlations of +0.05 or -0.05 indicate little or no association, since they are both close to 0.00.

In addition to the direction and magnitude of the Pearson correlation coefficient it is important to consider the shapes that a scatterplot of the data assumes. Examination of scatterplot diagrams is especially helpful when correlations are found to be near zero. Distributions may have correlations at or near zero and yet have strong curvilinear relationships. A fast, effective method of distinguishing a non-linear relationship from no relationship, both of which may exhibit correlations at or near zero, is by examination of the distribution's scatterplot diagram. If this shows that no apparent systematic deviation exists, then it is safe to assume that there is no relationship between the two variables. On the other hand relationships between two variables may have Pearson correlations very near zero and exhibit strong relationships, in a non-linear fashion (perhaps due to a "ceiling" effect, with all people scoring above a certain test score performing at the maximum level in the academy).

2.3.2 Range Restriction

The problem of restriction of range besets any criterion-related measure of validity whenever personnel are actually selected on the basis of the test used as the predictor. In the present case, police officers who go into training at the academies represent only an upper segment of the population which was actually tested, since only those above the cutoff score can be selected. A direct measure of the validity of the test can only be made for this upper segment of restricted range in the test scores. However, the validity of the list for the total population of those who took the test is of greater interest, for it is the validity of the whole test which indicates the predictive power of the test. This restriction almost always results in a reduction of the magnitude of the correlation coefficient. But, if the variance in the test scores for the total population is known as well as the variance of test scores in the restricted group, an estimate of the validity for the population can be made. This process of correcting for restriction in range was carried out in the present study, to yield "corrected" or "adjusted" correlations.

The correction for restriction of range can be applied to the correlation coefficients obtained for each academy to more accurately estimate the validity of the exam in predicting academy performance over the whole population of test takers. Since the variance of scores on the entry level police examination is different for each academy, this correction is applied to the individual correlations for each academy. The correction for restriction of range does rely upon an assumption that a linear relationship exists between exam and academy scores over the whole range of scores, i.e. the relationship which exists in the upper segment continues into the lower segment of the population as well.

2.3.3 Averaging Correlation Coefficients

Several academies were contacted and general information on curricula and scoring procedures was gathered. It was found that sufficient differences existed along several variables (namely, subject matter, length of the course, and subjects taught) so that treating the sample as one unit would not provide an accurate measure of validity. It was decided therefore to perform the analysis by subgrouping the sample according to academy attended. The simplest way of arriving at one validity coefficient from the separate academies would be to find the average of the correlation coefficients. However, this posed a statistical problem which was dealt with as follows: A correlation coefficient is only an index, it does not come from a scale with equal units. Differences among higher coefficients reflect larger differences in

association than differences among small coefficients. Thus, the difference between 0.90 and 0.80 is much greater than the difference between 0.20 and 0.10. If the various coefficients are relatively close to one another in magnitude it would be appropriate to simply average them. However, if there are large differences, some sort of transformation to a scale with equal units may be made. The best transformation is to use Fisher's Z coefficient (Guilford & Fruchter 1975, p. 319). In the process described by Guilford and Fruchter, the correlation coefficients are converted to Fisher's Z coefficients, and weighted by N-3 (the degrees of freedom of a Fisher's Z coefficient) for each academy when averaged. The obtained average Fisher's Z coefficient is converted back to a correlation coefficient. The sum of the degrees of freedom are used to evaluate the significance of the result.

2.3.4 Utility

An assessment of the practical significance the utility of the test was made. This is based upon: (1) the magnitude of the validity coefficient; (2) the selection ratio, the number of job openings to the number of applicants; and (3) the success ratio, the number of hires considered successful. The Taylor-Russell tables give the percentage of hires considered successful using the selection system when the previous three variables are considered.

Thus, an assessment of the validity of the test, and the sub-tests, can be made by obtaining a correlation of the academy scores with exam scores and sub-scores for each academy, correcting these coefficients for range restriction, and obtaining a weighted average through a Fisher's Z transformation. An assessment of practical utility can be made by using these validity coefficients, and obtaining selection ratios and success ratios in conjunction with use of the Taylor-Russell tables.

RESULTS

3.1 Subjects

There was a total of 376 subjects (N=376), 338 males and 38 females. This included a total of 175 veterans and 201 non-veterans. The ethnic composition was: 314 non-minorities, 52 Blacks, and 10 Spanish-Surnamed. The number of appointees per academy ranged from 14 to 71, and the number of minorities per academy ranged from 0 to 15. (The sample of this study is further described by academy in Table A1*.) According to self-reported data on 341 subjects, 304 have a high school diploma and 29 have Educational Equivalency Certificates.

* Appendices contain more detailed tables of descriptive statistics and correlations. These Tables are prefixed, such as "A" (e.g. Table A1). Tables and Figures numbered without prefix are found in the text.

Means and standard deviations of exam score for ethnic and sex breakdowns are given below in Table 1.

Table 1: Number and Mean Test Scores of Applicants by Ethnic Group and Sex

Group	# In Pop.	% Of Pop.	Mean Raw Score*	S.D.
Native American	182	.71	42.37	11.58
Blacks	1,398	7.02	38.81	10.50
Spanish Surnamed	481	2.42	31.60	13.80
Orientals	85	.43	44.40	10.41
Caucasian	16,873	84.76	48.96	8.56
Other	700	3.516	46.51	10.28
Male	16,695	83.87	47.82	9.62
Female	3,148	15.80	47.15	9.80

*Raw Score refers to the number of items answered correctly.

3.2 Predictor (IPMA EXAM)

The original applicant population which was scored in 1975, had an N of 22,398, a mean percentage score of 68.6 with a standard deviation of 13,663. In the present rescoring 20,467 cases were verified by optical scanner as completed; this amounted to some 90.3% of the original applicant group. The remainder of the records were deemed incomplete due to clerical or computer-related loss of exam or identification data. Analysis of the confidence interval of the difference between the means of this scoring and the original scoring is summarized in Table A2. The percentage mean of the present scoring (N=20,467) is 66.67 with a standard deviation of 14. 138.

The mean raw score of the validation sample on the entry level police examination was 57.186 from a possible total score of 71, the standard deviation was 5.47; this corresponds to a percentage mean score of 80.54 and a standard deviation of 7.70. Mean exam scores and academy grades are given in Table A3. Descriptive statistics for the present scoring by subtests may be found in Table A4.

Frequency distributions of the demographic data, the frequency of response to the self-report inventory portion of the examination by score, are given in Table A5.

The reliability coefficient, determined by Kuder-Richardson's formula 20 is r=0.954. This coefficient is similar to an earlier estimate arrived at by Kuder-Richardson's formula 21 of r=0.9454. The Dale-Chall readability index was derived as 7.25, or 9-10th grade level, for this IPMA J:A1 by an earlier study (California Selection Consulting Center, 1973).

3.3 Validity

The relationship between the examination score, and the academy grades for those in the sample was found to be strongly positive. The corrected Pearson coefficient of correlation was $r=0.719$ ($d.f. = 354$, $p < .001$). A more detailed description of the findings follows.

The basic data on sub-scores and raw scores are given in Appendix B, Tables B1-B6. These include the N for each academy, the mean and standard deviation for the particular score, and the unadjusted and the adjusted correlation coefficients. Overall descriptive statistics are given below in Table 2.

Table 2. Examination mean and standard deviation for the total population and the validation sample by examination sub-area.

	Sample				Exam Population*	
Score	N	Mean	s.d.	# of quest.	Mean	s.d.
Sub-score 1	343	19.455	2.614	25	15.436	3.649
Sub-score 2	343	4.324	.818	5	3.63	1.262
Sub-score 3	343	5.603	.799	6	5.16	1.415
Sub-score 4	343	11.863	1.727	15	9.77	2.728
Sub-score 5	343	16.079	2.401	20	13.34	3.641
Raw Score	376**	57.186	5.470	71	47.34	10.038

* (N=20,467)

** Some subscores were deleted due to omissions in the data collection and tabulation. Therefore the total N is greater than the N for the subtests.

The corrected correlation coefficients for raw score and subscores with academy grades are given in Table A6. The range of the correlation coefficients for overall raw score with academy grades varies from -0.017 to 0.713. The weighted average correlation co-efficient of the raw score with academy grade, without conversion to Fisher's Z scores (a conservative "average"), is 0.491 (d.f.=354, $p < .001$).

Table A7 gives the correlation coefficients by academy of raw score and subscores with academy grades, after adjustment for restriction of range. These are then converted to Fisher's Z scores, weighted (by N-3) and an average Z score is obtained which is reconverted to an r. These overall average adjusted correlation coefficients are given in Table 3 below, along with the weighted (without conversion to Fisher's Z) average r for the unadjusted correlation. Throughout the study, average r's are weighted by the degrees of freedom of the subsample (i.e. the academy). All unadjusted average correlation coefficients are computed without conversion to Fisher's Z, and all average adjusted r's are computed using conversion to Fisher's Z coefficients, averaging these, then converting back to an average r.

There were not enough minorities in any one academy to allow statistical tests of significance to have any substantial meaning. The highest number of minorities was at the Boston Academy where there were 15. However, to give an idea of possible directions of difference between minorities and non-minorities, statistics are given in Tables A8 and A9 for minority subsamples for those academies with a minority $n \geq 10$. Table A8 contains means and standard deviations for academy grade and exam score, and Table A9 contains validity data for minorities versus non-minorities.

Table 3

Overall Average Unadjusted and

Adjusted Validity Coefficients for Total Score

and Sub-Scores

	Unadjusted			Adjusted		
Sub-score	r	d.f.	p	r	d.f.	p
1	.367	321	.001	.486	310	.001
2	.359	321	.001	.526	310	.001
3	.126	321	.05	.269	310	.001
4	.286	321	.001	.445	310	.001
5	.333	321	.001	.511	310	.001
Total Score	.491	354	.001	.719	343	.001

By determining the standard error of the mean score, one can determine the accuracy provided by a given academy sample size. A sample size of 30 results in a 95% confidence of being within 3% of the mean of the population as a whole. With this as a gauge of the accuracy of a sample size of 30, an average correlation for only those academies of n=30 is given. The unadjusted weighted average and the weighted adjusted r after adjustment for restriction of range for raw score and and sub-scores are given below in Table 4.

Although the highest N for minorities (Black and Spanish-Surnamed) for any academy was only 15, a check was made on the four (4) academies which had minority subsamples of 10 or greater. These results, and description of means and standard deviations are given in Table A8 & A9. One validity coefficient for minorities was found significant, that of Boston ($r=0.71$, $d.f.=13$, $p < .002$).

Table 4

Overall Average Unadjusted and Adjusted Validity Coefficients

for Those Academies With $n \geq 30$

	Unadjusted		Adjusted		
Sub-score	r	d.f.	r_c	d.f.	$Z(r_c)$
1	.426	227	.553	222	.624
2	.345	227	.492	222	.539
3	.195	227	.389	222	.399
4	.279	227	.417	222	.444
5	.328	227	.513	222	.568
Total Score	.503	251	.754	246	.982

Discussion

4.1 Validity

There is a strong relationship between a score on the 1975 examination and later performance in academy training. The unadjusted correlation coefficients which index this relationship are both statistically significant and quite high. The overall unadjusted average r of 0.49 indicates that within the restricted sample of the study, as much as 25% of the variance in academy grades is explained by the scores on the examination. The corrected average r of 0.719 indicates that for the group of applicants taking the examination 50% of the variance in obtained academy grades would be explained by examination scores. By way of comparison, typical r's are about 0.30. By any standard this test can serve as a useful predictive instrument.

4.2 Predictor (IPMA Exam)

High test reliability was found for the examination. Although the examination has very high validity, there may be other test areas which are job related and, if included in the examination, would yield even greater predictive power. In the future research should be undertaken to explore this possibility.

The test security of the particular items used on the present examination can no longer be assured since over 20,000 persons have seen the questions. It is suggested that in the future tests be employed that measure the same areas (using similar questions). The extent to which such new tests are measuring the same areas as the present test may be assessed by empirical means.

4.3 Statistical Relability and Sub-Sample

A word of caution must be interjected about the interpretation of overall average coefficients. Since these are dependent upon the statistical power of the subsamples from which they are derived they suffer from being partially based on subsamples of small N, although this is considered in the weighting procedure. It was felt that deriving a figure which was based upon only those samples of an $n \geq 30$ would be useful. As can be seen from Table 4, for the five academies with $n \geq 30$, the validities were comparable to, even slightly higher than, the full sample. A similar pattern of correlations for the sub-scores as for the full sample is also present. Thus, by making the constraints for the computations more stringent, the only effect is to increase slightly the observed validity coefficient.

4.4 Differential Prediction

Ideally, the task of a predictive validity study is to determine to what degree performance on the predictor reflects performance on the criterion. Speaking strictly within the context of validity, there seems little reason to identify and consider various subgroups, eithnic or otherwise, unless there is an indication that these characteristics provide better indicators than does a test score.

The stratification of mean scores displays differential performance of the identifiable ethnic groups with respect to exam scores. This study is not designed to explore the cause of these results and care should be exercised in their interpretation. The small percentage of minority applicants limited the number who eventually were included in police academy training, even though provisions were made by the courts for increased minority inclusion. In the interpretation of the validity coefficient of the various academies' minority members, care should be taken since these sample sizes did not exceed fifteen. The results found in these tables of minority performance should in general be taken as possibilities only and not be interpreted as substantiated facts. It is impossible to develop any general trend from these data. The results are included for speculative purposes.

4.5 Training and Tenure

Two factors within the overall interpretation warrant additional consideration. First, the relationship between job performance must be established.

Training is required by law in Massachusetts, and an appointee is probationary until s/he meet the requirement. It is therefore a substantial and common facet of the police officer function throughout the state. One interesting fact did emerge in the analysis of the Boston Academy. With the highest N and the strongest positive correlation, Boston's curriculum is unique in that it alternates 4 weeks of training with 4 weeks on the job for the 24 week course. A further requirement minimized the potentially confounding effects of the second factor, tenure. Appointees must complete training within one year of date appointed which gives an upper limit of nine months of tenure, since the minimum length of training is 12 weeks. The literature on the subject of tenure does not consider this a long enough time to affect performance levels; it was therefore ruled out from consideration (Anastasi, 1976).

Since the Boston Academy grade is partially dependent upon actual police work, the fact that this academy had the highest correlation supports inferences of the exam's ability to predict on-the-job performance.

4.6 Utility

It is good practice to assess the practical significance, the utility of the examination. This is influenced by: (1) the magnitude of the validity coefficient, (2) the selection ratio of the number of job openings to the number of applicants, and (3) the success ratio, the percentage of hires consider successful.

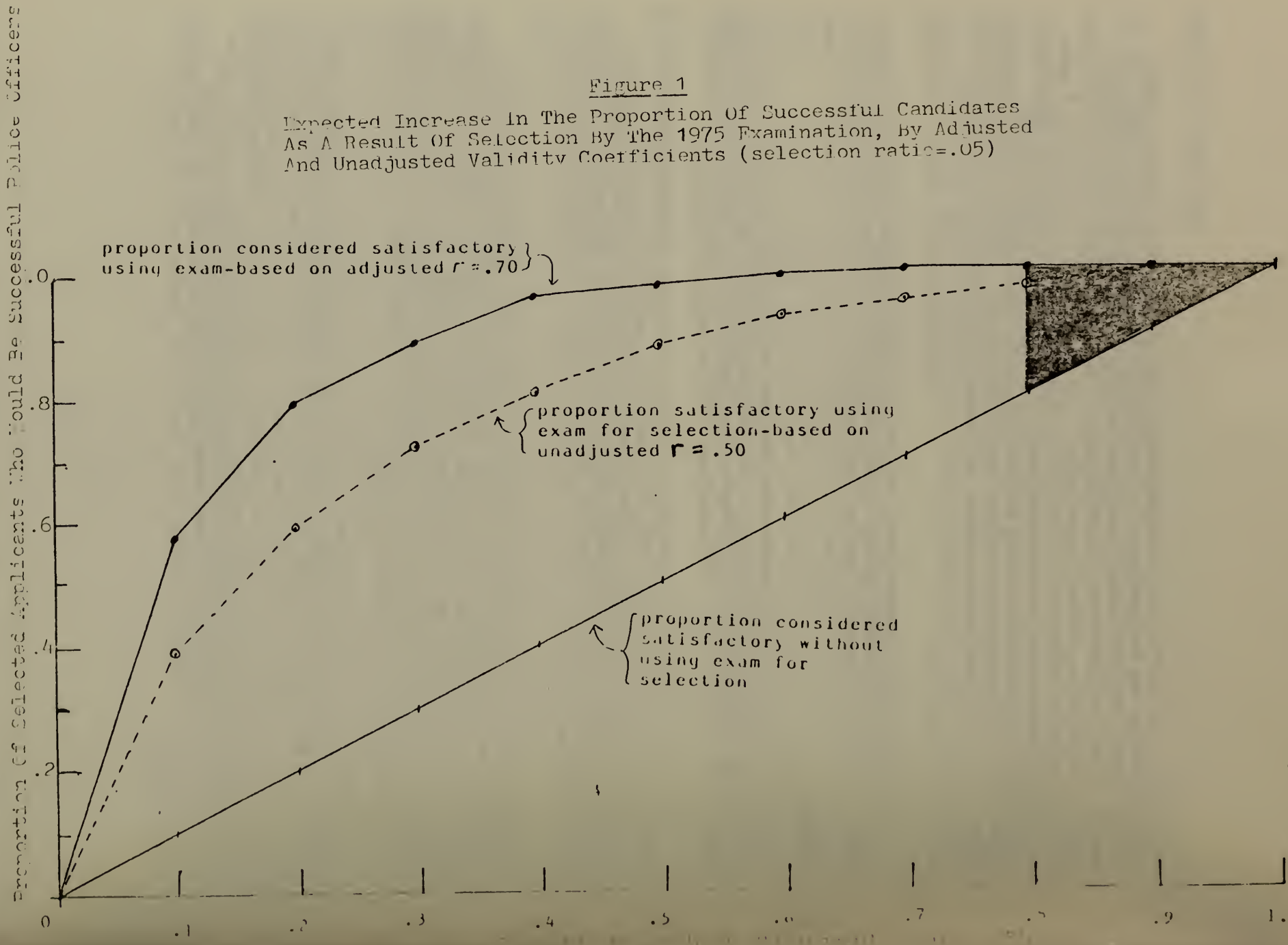
The selection ratio, determined by dividing the number of hires from the examination by the number who took the examination, was found to be 0.05. A set of tables developed by Taylor & Russell permits a numerical estimate to be made of the gain in proportion of successful applicants due to the examination. In order to determine this, one must enter the validity coefficient, the selection ratio, and the sucesss ratio.

The criterion for success as a police officer is not clear cut; there is no standard method for arriving at success. One possibility would be to consider as successful all candidates who would be expected to finish and pass the training, considering as unsuccessful all those who dropped out or failed. Another method would be to use a cutoff on the criterion, i.e. the academy grade. Perhaps a median split on all academies would suffice; or considering as successful those who obtained a score greater than one standard deviation below the mean would also suffice. But all of these methods are rather arbitrary.

Since there are multiple methods of arriving at a criterion of success it was decided to show graphically what increases in percentage successful result from a range of success ratios for the obtained $r = .50$ and $r_c = .70$ (rounded), and selection ratio of 0.05 Figure 1 shows the relationship with the straight line representing the proportion successful without the examination and the curves representing the proportion successful using the examination. The difference between the two shows the increase in accuracy of selection of successful candidates when using the examination for selection. As can be seen, any success ratio short of 1.00 results in an increase in accuracy, and the lower the initial success ratio the greater the increase.

Figure 1

Expected Increase In The Proportion Of Successful Candidates As A Result Of Selection By The 1975 Examination, By Adjusted And Unadjusted Validity Coefficients (selection ratio=.05)



In addition to a consideration of the foregoing factors, consideration should also be made of the human and economic risk of hiring an unqualified employee. In regard to the job of Police Officer the risks to society of hiring an unqualified. Policeman are quite high, and a lower degree of practical significance is justified. Thus, even if the success ratio is extremely high, an increase in proportion successful would justify the use of the test.

From Figure 1, we can see that if 50% of the applicants can do the job, then the failure rate without using the examination will be about 50%, while the failure rate using the examination will be about 2%. This is a very dramatic decrease in the failure rate of new police officers. The failure rate is decreased by a fraction of 25 by use of the examination.

Conclusion

The examination administered in 1975 has been shown to be a valid test. The test development process linked the content of the test with the content of the job. Criterion-related validity seen in other jurisdictions was also clearly seen in Massachusetts. The examination is reliable and has high validity and high utility. The use of the examination is strongly supported.

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APPENDIX A

Table A1. Sex, Veteran and Ethnic Group Status of the Validation Sample, by Academy

TABLE A1

	MALE	FEMALE	VETERAN	DISABLED VETERAN	NON-VETERAN	NON-MINORITIES	BLACK	SPANISH-SURNAMED	OVERALL N
Brookline	17	0	2	2	13	17	0	0	17
Barnstable	12	2	6	0	8	11	3	0	14
Waltham	14	2	2	5	9	15	1	0	16
Springfield	44	5	9	3	37	38	10	1	49
S.E. Mass	58	6	17	3	42	63	1	0	64
Medford	20	0	9	4	7	16	3	1	20
M.D.C.	28	2	8	18	4	18	11	1	30
Boston	59	12	17	24	30	56	13	2	71
New Bedford	18	4	2	10	10	12	8	2	22
State	46	1	16	4	27	45	1	1	47
Worcester	22	4	9	3	14	23	1	2	26
Totals	338	38	99	76	201	314	52	10	

STATISTIC	SAMPLE 1	SAMPLE 2
SAMPLE MEAN	68.3	66.37
SAMPLE VARIANCE	186.678	199.883
SAMPLE STD DEVIATION	13.663	14.138
SAMPLE SIZE	22398	20467
POPULATION SIZE	22398	22398
ESTIM POPN STD DEV	13.663	14.138
STD ERROR OF MEAN	0	2.901745E-2

DIFF BETWEEN MEANS	1.93
STD ERROR OF DIFF	2.901745E-2
DEGR OF FREEDOM (DIFF)	20466

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANSX

CONF LEVEL	LOWER LIM	UPPER LIM
50	1.91043	1.94957
75	1.89662	1.96338
90	1.88227	1.97773
95.	1.87312	1.98688
99.	1.85525	2.00475
99.9	1.8345	2.0255
99.99	1.81708	2.04292
99.999	1.80179	2.05821

SRU 0.051 UNTS.

RUN COMPLETE.

Table 1.2. Summary Statistics And Confidence Limits For The Total Sample Of Applicants (Sample 1) And For The Sample For Which Interviews Could Be Computed.

TABLE A 3

EXAM SCORES AND ACADEMY GRADES BY ACADEMY

	ACADEMY GRADE		EXAM RAW SCORE			
	Grade $\bar{X}$	S.D.	Exam $\bar{X}$	S.D.	N	SE
Brookline	87.488	5.1093	56.47	4.9512	17	1.20
Barnstable	91.6	4.4054	58.928	4.5313	14	1.21
Waltham	86.565	3.772	57.875	7.283	16	1.821
Springfield	87.196	5.2407	57.12	6.6415	49	.949
S.E. Mass	87.2450	5.4917	56.20	5.0275	64	.628
Medford	90.8110	3.3542	56.90	5.3104	20	1.187
M.D.C.	92.100	2.264	55.3667	2.9182	30	.533
Boston	87.741	4.27	51.90	4.8878	71	.580
New Bedford	87.477	4.0160	54.4091	3.5812	22	.763
State	91.3706	4.23	59.1915	5.94	47	.866
Worcester	81.745	5.1382	57.9231	6.5661	26	1.29
$\bar{X}$	89.2	3.997	57.186	5.470	376	

FILE CPSCORE (CREATION DATE = 78/09/26.)

VARIABLE S1 SUBSCORE 1

MEAN	15.436	STD ERR	.026	STD DEV	3.649
VARIANCE	13.319	KURTOSIS	.268	SKEWNESS	-.553
MINIMUM	0	MAXIMUM	24.000	SUM	315935.000
C.V. PCT	23.642	.95 C.I.	15.386	TC	15.486
VALID CASES	20467	MISSING CASES	0		

VARIABLE S2 SUBSCORE 2

MEAN	3.629	STD ERR	.009	STD DEV	1.262
VARIANCE	1.592	KURTOSIS	-.253	SKEWNESS	-.727
MINIMUM	0	MAXIMUM	6.000	SUM	74270.000
C.V. PCT	34.770	.95 C.I.	3.611	TC	3.646
VALID CASES	20467	MISSING CASES	0		

VARIABLE S3 SUBSCORE 3

MEAN	5.159	STD ERR	.010	STD DEV	1.415
VARIANCE	2.003	KURTOSIS	17.336	SKEWNESS	-.064
MINIMUM	0	MAXIMUM	27.000	SUM	105574.000
C.V. PCT	27.434	.95 C.I.	5.139	TC	5.178
VALID CASES	20467	MISSING CASES	0		

VARIABLE S4 SUBSCORE 4

MEAN	9.771	STD ERR	.019	STD DEV	2.728
VARIANCE	7.440	KURTOSIS	.605	SKEWNESS	-.816
MINIMUM	0	MAXIMUM	15.000	SUM	199973.000
C.V. PCT	27.916	.95 C.I.	9.733	TC	9.808
VALID CASES	20467	MISSING CASES	0		

FILE CPSCORE (CREATION DATE = 78/09/28.)

VARIABLE SSA	SUPSCORE SA				
MEAN	4.323	STD ERR	.008	STD DEV	1.109
VARIANCE	1.231	KURTOSIS	3.448	SKEWNESS	-1.923
MINIMUM	0	MAXIMUM	5.000	SUM	88485.000
C.V. PCT	25.660	.95 C.I.	4.308	TC	4.339
VALID CASES	20467	MISSING CASES	0		

VARIABLE SSB	SUPSCORE SB				
MEAN	9.019	STD ERR	.021	STD DEV	2.949
VARIANCE	8.694	KURTOSIS	.012	SKEWNESS	-.485
MINIMUM	0	MAXIMUM	15.000	SUM	184594.000
C.V. PCT	32.693	.95 C.I.	8.979	TC	9.060
VALID CASES	20467	MISSING CASES	0		

VARIABLE SS	SUPSCORE S				
MEAN	13.342	STD ERR	.025	STD DEV	3.641
VARIANCE	13.260	KURTOSIS	.699	SKEWNESS	-.829
MINIMUM	0	MAXIMUM	20.000	SUM	273079.000
C.V. PCT	27.292	.95 C.I.	13.293	TC	13.392
VALID CASES	20467	MISSING CASES	0		

VARIABLE SCOR	RAW SCORE				
MEAN	47.736	STD ERR	.070	STD DEV	10.034
VARIANCE	100.756	KURTOSIS	.902	SKEWNESS	-.919
MINIMUM	0	MAXIMUM	68.000	SUM	976831.000
C.V. PCT	21.205	.95 C.I.	47.199	TC	47.474
VALID CASES	20467	MISSING CASES	0		

FILE CPSCORE (CREATION DATE = 78/09/26.)

VARIABLE SCORE		FREQ SCORE			
MEAN	66.671	STD ERR	.099	STD DEV	14.138
VARIANCE	199.874	KURTOSIS	.902	SKEWNESS	-.919
MINIMUM	0	MAXIMUM	95.775	SUM	1364550.704
C.V. PCT	21.205	.95 C.I.	66.477	TC	66.864

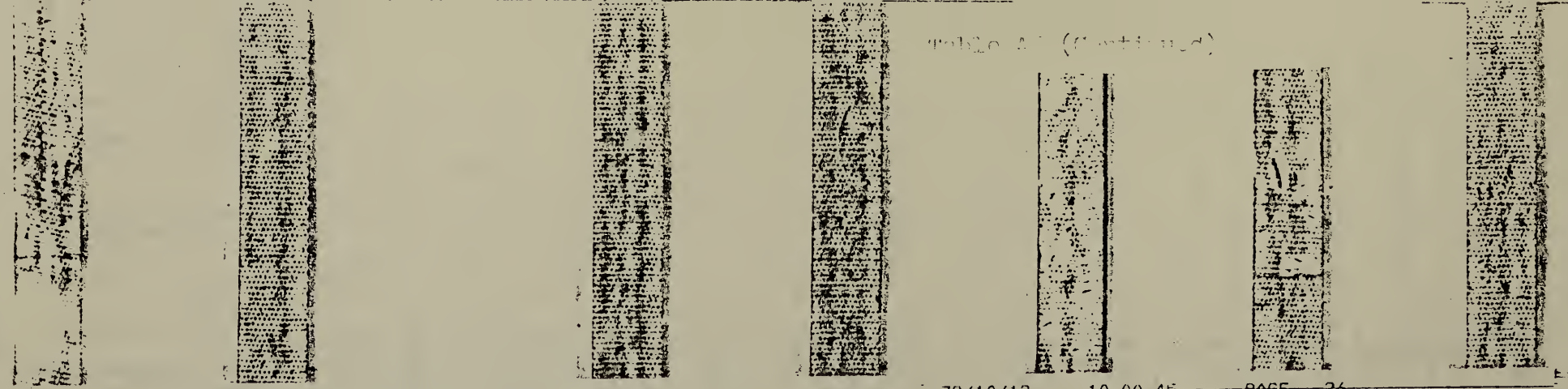
VALID CASES 20467 MISSING CASES 0

0 SCOR
0 COUNT
ROW PCT
COL PCT
TAB PCT

DVAR		2	3	5	6	7	8	9	10	11	12	13	ROW TOTAL
SQ1 MALE		0	2	2	1	2	1	2	3	6	10	11	16695
		0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	83.9
		0	100.0	100.0	50.0	66.7	50.0	100.0	60.0	85.7	71.4	73.3	
		0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	
SQ2 FEMALE		1	0	0	1	1	1	0	1	1	4	4	3146
		.0	0	0	.0	.0	.0	0	.0	.0	.1	.1	15.8
		100.0	0	0	50.0	33.3	50.0	0	20.0	14.3	28.6	26.7	
		.0	0	0	.0	.0	.0	0	.0	.0	.0	.0	
SQ3 AMERICAN-INDIAN		0	0	0	0	0	0	0	0	0	0	0	182
		0	0	0	0	0	0	0	0	0	0	0	.9
		0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	
SQ4 BLACK		0	0	0	0	0	0	0	0	1	4	4	1398
		0	0	0	0	0	0	0	0	.1	.3	.3	7.0
		0	0	0	0	0	0	0	0	14.3	28.6	26.7	
		0	0	0	0	0	0	0	0	.0	.0	.0	
SQ5 WHITE		0	0	0	1	1	1	1	0	0	1	1	16973
		0	0	0	.0	.0	.0	.0	0	0	.0	.0	85.3
		0	0	0	50.0	33.3	50.0	50.0	0	0	7.1	6.7	
		0	0	0	.0	.0	.0	.0	0	0	.0	.0	
SQ6 SPANISH-SURNAMED		1	2	2	1	2	1	1	4	6	8	8	481
		.2	.4	.4	.2	.4	.2	.2	.8	1.2	1.7	1.7	2.4
		100.0	100.0	100.0	50.0	66.7	50.0	50.0	80.0	85.7	57.1	53.3	
		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
SQ7 ORIENTAL		0	0	0	0	0	0	0	0	0	0	0	85
		0	0	0	0	0	0	0	0	0	0	0	.4
		0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	
COLUMN TOTAL		1 .0	2 .0	2 .0	2 .0	3 .0	2 .0	2 .0	5 .0	7 .0	14 .1	15 .1	19906 100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS

O(CONTINUED)



FILE OPSCORE (CREATION DATE = 78/10/12.)

* * * * * * * * * * C R O S S _ T A B U L A T I O N * * * * * * * * * * *

DVAR (TABULATING 1) SPECIAL QUESTIONS
BY SCOR RAW SCORE

DVAR		SCOR 2	3	5	6	7	8	9	10	11	12	13	ROW TOTAL
SQ8	COUNT	0	0	0	0	0	0	0	1	1	0	2	700
	ROW PCT	0	0	0	0	0	0	0	.1	.1	0	.3	3.5
OTHER	COL PCT	0	0	0	0	0	0	0	20.0	14.3	0	13.3	
	TAB PCT	0	0	0	0	0	0	0	.0	.0	0	.0	
SQ9	COUNT	1	2	1	2	1	1	1	1	4	5	12	17272
	ROW PCT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	86.8
H.S. DIPLOMA	COL PCT	100.0	100.0	50.0	100.0	33.3	50.0	50.0	20.0	57.1	35.7	80.0	
	TAB PCT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	
SQ10	COUNT	1	0	0	0	1	0	1	1	0	4	1	1624
	ROW PCT	.1	0	0	0	.1	0	.1	.1	0	.2	.1	8.2
G.E.D.	COL PCT	100.0	0	0	0	33.3	0	50.0	20.0	0	28.6	6.7	
	TAB PCT	.0	0	0	0	.0	0	.0	.0	0	.0	.0	
SQ11	COUNT	0	0	0	0	0	1	1	0	1	0	2	3680
	ROW PCT	0	0	0	0	0	.0	.0	0	.0	0	.1	18.5
3 YRS ARMED FORCES	COL PCT	0	0	0	0	0	50.0	50.0	0	14.3	0	13.3	
	TAB PCT	0	0	0	0	0	.0	.0	0	.0	0	.0	
SQ12	COUNT	0	0	0	0	1	0	0	2	2	5	2	556
	ROW PCT	0	0	0	0	.2	0	0	.4	.4	.9	.4	28
NONE OF SQ9 TO SQ11	COL PCT	0	0	0	0	33.3	0	0	40.0	28.6	35.7	13.3	
	TAB PCT	0	0	0	0	.0	0	0	.0	.0	.0	.0	
COLUMN		1	2	2	2	3	2	2	5	7	14	15	19906
TOTAL		.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS

1

FILE - OPSCORE (CREATION DATE - 78/10/12.)

0* * * * * * * * * * * * C R O S S T A B U L A T I O N * * * * * * * * * * * *

DVAR (TABULATING 1) SPECIAL QUESTIONS

BY SCOR RAW SCORE

* PAGE 2 OF 12

0 SCOR

0 COUNT

ROW PCT

COL PCT

TAB PCT

DVAR		14	15	16	17	18	19	20	21	22	23	24	ROW TOTAL
MALE	SQ1	12	17	24	35	26	39	37	53	45	61	64	16695
		.1	.1	.1	.2	.2	.2	.2	.3	.3	.4	.4	83.9
		70.6	89.5	85.7	87.5	68.4	90.7	86.0	89.8	77.6	82.4	81.0	
		.1	.1	.1	.2	.1	.2	.2	.3	.2	.3	.3	
FEMALE	SQ2	5	2	4	5	12	4	6	5	15	14	15	3146
		.2	.1	.1	.2	.4	.1	.2	.2	.5	.4	.5	15.8
		29.4	10.5	14.3	12.5	31.6	9.3	14.0	8.5	25.9	18.9	19.0	
		.0	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	
AMERICAN INDIAN	SQ3	1	0	1	0	2	3	1	2	3	2	1	182
		.5	0	.5	0	1.1	1.6	.5	1.1	1.6	1.1	.5	.9
		5.9	0	3.6	0	5.3	7.0	2.3	3.4	5.2	2.7	1.3	
		.0	0	.0	0	.0	.0	.0	.0	.0	.0	.0	
BLACK	SQ4	2	5	4	9	16	13	12	21	19	17	23	139[illegible]
		.1	.4	.3	.6	1.1	.9	.9	1.5	1.4	1.2	1.6	7.0
		11.8	26.3	14.3	22.5	42.1	30.2	27.9	35.6	32.8	23.0	29.1	
		.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	
WHITE	SQ5	5	4	5	13	2	12	10	18	27	33	34	16[illegible]3
		.0	.0	.0	.1	.0	.1	.1	.1	.2	.2	.2	85.3
		29.4	21.1	17.9	32.5	5.3	27.9	23.3	30.5	46.6	44.6	43.0	
		.0	.0	.0	.1	.0	.1	.1	.1	.1	.2	.2	
SPANISH SURNAMED	SQ6	7	7	16	13	14	13	17	16	6	18	10	481
		1.5	1.5	3.3	2.7	2.9	2.7	3.5	3.3	1.2	3.7	2.1	2.[illegible]
		41.2	36.8	57.1	32.5	36.8	30.2	39.5	27.1	10.3	24.3	12.7	
		.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	
ORIENTAL	SQ7	0	0	0	0	1	2	0	0	0	1	2	85
		0	0	0	0	1.2	2.4	0	0	0	1.2	2.4	.4
		0	0	0	0	2.6	4.7	0	0	0	1.4	2.5	
		0	0	0	0	.0	.0	0	0	0	.0	.0	

Table A5 (Continued)

DVAR	SCOR	14	15	16	17	18	19	20	21	22	23	24	ROW TOTAL
SQ8	COUNT	2	3	1	1	1	1	1	4	3	3	8	700
OTHER	ROW PCT	.3	.4	.1	.1	.1	.1	.1	.6	.4	.4	1.1	3.5
	COL PCT	11.8	15.8	3.6	2.5	2.6	2.3	2.3	6.8	5.2	4.1	10.1	
	TAB PCT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
SQ9	COUNT	9	10	17	21	23	28	24	39	31	46	46	17272
H.S. DIPLOMA	ROW PCT	.1	.1	.1	.1	.1	.2	.1	.2	.2	.3	.3	86.8
	COL PCT	52.9	52.6	60.7	52.5	60.5	65.1	55.8	66.1	53.4	62.2	58.2	
	TAB PCT	.0	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	
SQ10	COUNT	6	2	3	10	5	5	5	11	9	12	17	1624
G.E.D.	ROW PCT	.4	.1	.2	.6	.3	.3	.3	.7	.6	.7	1.0	8.2
	COL PCT	35.3	10.5	10.7	25.0	13.2	11.6	11.6	18.6	15.5	16.2	21.5	
	TAB PCT	.0	.0	.0	.1	.0	.0	.0	.1	.0	.1	.1	
SQ11	COUNT	3	4	1	2	2	4	4	9	5	11	14	3680
3 YRS ARMED FORCES	ROW PCT	.1	.1	.0	.1	.1	.1	.1	.2	.1	.3	.4	18.5
	COL PCT	17.6	21.1	3.6	5.0	5.3	9.3	9.3	15.3	8.6	14.9	17.7	
	TAB PCT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	
SQ12	COUNT	5	1	2	4	7	4	11	7	13	9	10	556
NONE OF SQ9 TO SQ11	ROW PCT	.9	.2	.4	.7	1.3	.7	2.0	1.3	2.3	1.6	1.8	2.8
	COL PCT	29.4	5.3	7.1	10.0	18.4	9.3	25.6	11.9	22.4	12.2	12.7	
	TAB PCT	.0	.0	.0	.0	.0	.0	.1	.0	.1	.0	.1	
	COLUMN	17	19	28	40	38	43	43	59	58	74	79	19906
	TOTAL	.1	.1	.1	.2	.2	.2	.2	.3	.3	.4	.4	100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS
O(CONTINUED)
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FILE OPSCORE (CREATION DATE = 78/10/12.)
O* * * * * * * * * * * * C R O S S T A B U L A T I O N * * * * * * * * * * * *
DVAR (TABULATING 1) SPECIAL QUESTIONS
BY SCOR RAW SCORE
* PAGE 9 OF 12

DVAR	SCOR	25	26	27	28	29	30	31	32	33	34	35	ROW TOTAL
SQ8	COUNT												
OTHER	ROW PCT												
	COL PCT												
SQ9	COUNT												
H.S. DIPLOMA	ROW PCT												
	COL PCT												
SQ10	COUNT												
G.E.D.	ROW PCT												
	COL PCT												
SQ11	COUNT												
3 YRS ARMED FORCES	ROW PCT												
	COL PCT												
SQ12	COUNT												
NONE OF SQ9 TO SQ11	ROW PCT												
	COL PCT												
	COLUMN												
	TOTAL												

DVAR - (TABULATING — 1) SPECIAL QUESTIONS
BY SCOR RAW SCORE

SCOR

DVAR	COUNT / ROW PCT / COL PCT / TAB PCT	25	26	27	28	29	30	31	32	33	34	35	ROW TOTAL
SQ1 MALE		73	68	93	84	107	103	132	154	159	186	227	16695
		.4	.4	.6	.5	.6	.6	.8	.9	1.0	1.1	1.4	83.9
		84.9	79.1	85.3	84.8	84.3	81.7	85.7	79.4	80.3	81.9	83.5	
		.4	.3	.5	.4	.5	.5	.7	.8	.8	.9	1.1	
SQ2 FEMALE		12	17	16	15	21	23	22	39	37	39	43	3146
		.4	.5	.5	.5	.7	.7	.7	1.2	1.2	1.2	1.4	15.8
		14.0	19.8	14.7	15.2	16.5	18.3	14.3	20.1	18.7	17.2	15.8	
		.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	
SQ3 AMERICAN INDIAN		1	0	3	4	1	3	5	2	3	1	3	182
		.5	0	1.6	2.2	.5	1.6	2.7	1.1	1.6	.5	1.6	.9
		1.2	0	2.8	4.0	.8	2.4	3.2	1.0	1.5	.4	1.1	
		.0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
SQ4 BLACK		27	20	27	24	37	25	30	51	40	43	36	1398
		1.9	1.4	1.9	1.7	2.6	1.8	2.1	3.6	2.9	3.1	2.6	7.0
		31.4	23.3	24.8	24.2	29.1	19.8	19.5	26.3	20.2	18.9	13.2	
		.1	.1	.1	.1	.2	.1	.2	.3	.2	.2	.2	
SQ5 WHITE		45	50	58	58	73	86	99	114	138	171	210	16573
		.3	.3	.3	.3	.4	.5	.6	.7	.8	1.0	1.2	85.3
		52.3	58.1	53.2	58.6	57.5	68.3	64.3	58.8	69.7	75.3	77.2	
		.2	.3	.3	.3	.4	.4	.5	.6	.7	.9	1.1	
SQ6 SPANISH SURNAMED		12	10	15	12	7	7	11	12	9	8	12	481
		2.5	2.1	3.1	2.5	1.5	1.5	2.3	2.5	1.9	1.7	2.5	2.4
		14.0	11.6	13.8	12.1	5.5	5.6	7.1	6.2	4.5	3.5	4.4	
		.1	.1	.1	.1	.0	.0	.1	.1	.0	.0	.1	
SQ7 ORIENTAL		0	1	2	0	1	0	4	0	1	2	1	85
		0	1.2	2.4	0	1.2	0	4.7	0	1.2	2.4	1.2	.4
		0	1.2	1.8	0	.8	0	2.6	0	.5	.9	.4	
		0	.0	.0	0	.0	0	.0	0	.0	.0	.0	
COLUMN TOTAL		86	86	109	99	127	126	154	194	198	227	272	19906
		.4	.4	.5	.5	.6	.6	.8	1.0	1.0	1.1	1.4	100.0

FILE OPSCORE (CREATION DATE = 78/10/12.)

0* * * * * * * * * * * C R O S S T A B U L A T I O N * * * * * * * * * * *

DVAR (TABULATING 1) SPECIAL QUESTIONS

BY SCOR RAW SCORE

* PAGE 9 OF 12

0 SCOR

0 COUNT

ROW PCT

COL PCT

TAB PCT

DVAR	25	26	27	28	29	30	31	32	33	34	35	ROW TOTAL
SQ8	0	3	4	0	5	6	5	11	9	7	9	700
OTHER	0	.4	.6	0	.7	.9	.7	1.6	1.3	1.0	1.3	3.5
	0	3.5	3.7	0	3.9	4.8	3.2	5.7	4.5	3.1	3.3	
	0	.0	.0	0	.0	.0	.0	.1	.0	.0	.0	
SQ9	56	59	70	72	81	88	114	143	153	175	208	17272
H.S. DIPLOMA	.3	.3	.4	.4	.5	.5	.7	.8	.9	1.0	1.2	86.8
	65.1	68.6	64.2	72.7	63.8	69.8	74.0	73.7	77.3	77.1	76.5	
	.3	.3	.4	.4	.4	.4	.6	.7	.8	.9	1.0	
SQ10	12	8	16	12	14	16	18	24	26	26	29	1624
G.E.D.	.7	.5	1.0	.7	.9	1.0	1.1	1.5	1.6	1.6	1.8	8.2
	14.0	9.3	14.7	12.1	11.0	12.7	11.7	12.4	13.1	11.5	10.7	
	.1	.0	.1	.1	.1	.1	.1	.1	.1	.1	.1	
SQ11	9	15	16	17	32	16	20	23	36	38	46	3680
3 YRS ARMED FORCES	.2	.4	.4	.5	.9	.4	.5	.6	1.0	1.0	1.2	18.5
	10.5	17.4	14.7	17.2	25.2	12.7	13.0	11.9	18.2	16.7	16.9	
	.0	.1	.1	.1	.2	.1	.1	.1	.2	.2	.2	
SQ12	11	10	12	12	16	14	14	18	13	14	24	556
NONE OF SQ9 TO SQ11	2.0	1.8	2.2	2.2	2.9	2.5	2.5	3.2	2.3	2.5	4.3	2.8
	12.8	11.6	11.0	12.1	12.6	11.1	9.1	9.3	6.6	6.2	8.8	
	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	
COLUMN	86	86	109	99	127	126	154	194	198	227	272	19906
TOTAL	.4	.4	.5	.5	.6	.6	.8	1.0	1.0	1.1	1.4	100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS

0(CONTINUED)

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FILE OPSCORE (CREATION DATE = 78/10/12.)

0* * * * * * * * * * * C R O S S T A B U L A T I O N * * * * * * * * * * *

DVAR (TABULATING 1) SPECIAL QUESTIONS

BY SCOR RAW SCORE

* PAGE 10 OF 12

DVAR		SCOR 36	37	38	39	40	41	42	43	44	45	46	ROW TOTAL
SQ1	COUNT	243	250	323	326	418	432	462	515	486	575	607	16695
MALE	ROW PCT	1.5	1.5	1.9	2.0	2.5	2.6	2.8	3.1	2.9	3.4	3.6	83.9
	COL PCT	85.9	84.2	83.0	81.3	83.9	83.4	83.4	85.0	77.5	83.6	84.3	
	TAB PCT	1.2	1.3	1.6	1.6	2.1	2.2	2.3	2.6	2.4	2.9	3.0	
SQ2	COUNT	38	48	65	73	78	85	90	90	140	110	111	3146
FEMALE	ROW PCT	1.2	1.5	2.1	2.3	2.5	2.7	2.9	2.9	4.5	3.5	3.5	15.8
	COL PCT	13.4	16.2	16.7	18.2	15.7	16.4	16.2	14.9	22.3	16.0	15.4	
	TAB PCT	.2	.2	.3	.4	.4	.4	.5	.5	.7	.6	.6	
SQ3	COUNT	3	8	4	5	6	12	5	5	4	6	4	182
AMERICAN-INDIAN	ROW PCT	1.6	4.4	2.2	2.7	3.3	6.6	2.7	2.7	2.2	3.3	2.2	.9
	COL PCT	1.1	2.7	1.0	1.2	1.2	2.3	.9	.8	.6	.9	.6	
	TAB PCT	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	
SQ4	COUNT	40	38	44	54	68	55	44	52	54	46	53	1398
BLACK	ROW PCT	2.9	2.7	3.1	3.9	4.9	3.9	3.1	3.7	3.9	3.3	3.8	7.0
	COL PCT	14.1	12.8	11.3	13.5	13.7	10.6	7.9	8.6	8.6	6.7	7.4	
	TAB PCT	.2	.2	.2	.3	.3	.3	.2	.3	.3	.2	.3	
SQ5	COUNT	216	219	308	314	397	422	468	519	529	590	621	16973
WHITE	ROW PCT	1.3	1.3	1.8	1.8	2.3	2.5	2.8	3.1	3.1	3.5	3.7	85.3
	COL PCT	76.3	73.7	79.2	78.3	79.7	81.5	84.5	85.6	84.4	85.8	86.2	
	TAB PCT	1.1	1.1	1.5	1.6	2.0	2.1	2.4	2.6	2.7	3.0	3.1	
SQ6	COUNT	7	12	7	7	11	8	14	6	6	9	7	481
SPANISH-SURNAMED	ROW PCT	1.5	2.5	1.5	1.5	2.3	1.7	2.9	1.2	1.2	1.9	1.5	2.4
	COL PCT	2.5	4.0	1.8	1.7	2.2	1.5	2.5	1.0	1.0	1.3	1.0	
	TAB PCT	.0	.1	.0	.0	.1	.0	.1	.0	.0	.0	.0	
SQ7	COUNT	2	3	3	3	2	4	0	0	4	5	4	85
ORIENTAL	ROW PCT	2.4	3.5	3.5	3.5	2.4	4.7	0	0	4.7	5.9	4.7	.4
	COL PCT	.7	1.0	.8	.7	.4	.8	0	0	.6	.7	.6	
	TAB PCT	.0	.0	.0	.0	.0	.0	0	0	.0	.0	.0	
COLUMN TOTAL		283	297	389	401	498	518	554	606	627	688	720	19906
		1.4	1.5	2.0	2.0	2.5	2.6	2.8	3.0	3.1	3.5	3.6	100.0

DVAR		SCOR 36	37	38	39	40	41	42	43	44	45	46	ROW TOTAL
SQ8 OTHER	COUNT	10	17	22	17	14	16	20	24	29	26	26	700
	ROW PCT	1.4	2.4	3.1	2.4	2.0	2.3	2.9	3.4	4.1	3.7	3.7	3.5
	COL PCT	3.5	5.7	5.7	4.2	2.8	3.1	3.6	4.0	4.6	3.8	3.6	
	TAB PCT	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	
SQ9 H.S. DIPLOMA	COUNT	215	236	291	323	399	425	458	514	532	591	625	17272
	ROW PCT	1.2	1.4	1.7	1.9	2.3	2.5	2.7	3.0	3.1	3.4	3.6	86.8
	COL PCT	76.0	79.5	74.8	80.5	80.1	82.0	82.7	84.8	84.8	85.9	86.8	
	TAB PCT	1.1	1.2	1.5	1.6	2.0	2.1	2.3	2.6	2.7	3.0	3.1	
SQ10 G.E.D.	COUNT	30	35	49	37	70	64	59	53	68	60	65	1624
	ROW PCT	1.8	2.2	3.0	2.3	4.3	3.9	3.6	3.3	4.2	3.7	4.0	8.2
	COL PCT	10.6	11.8	12.6	9.2	14.1	12.4	10.6	8.7	10.8	8.7	9.0	
	TAB PCT	.2	.2	.2	.2	.4	.3	.3	.3	.3	.3	.3	
SQ11 3 YRS ARMED FORCES	COUNT	60	60	86	67	92	102	96	113	117	140	163	3680
	ROW PCT	1.6	1.6	2.3	1.8	2.5	2.8	2.6	3.1	3.2	3.8	4.4	18.5
	COL PCT	21.2	20.2	22.1	16.7	18.5	19.7	17.3	18.6	18.7	20.3	22.6	
	TAB PCT	.3	.3	.4	.3	.5	.5	.5	.6	.6	.7	.8	
SQ12 NONE OF SQ9 TO SQ11	COUNT	17	15	23	23	23	14	25	23	14	16	18	554
	ROW PCT	3.1	2.7	4.1	4.1	4.1	2.5	4.5	4.1	2.5	2.9	3.2	2.8
	COL PCT	6.0	5.1	5.9	5.7	4.6	2.7	4.5	3.8	2.2	2.3	2.5	
	TAB PCT	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	
COLUMN TOTAL		283	297	389	401	498	518	554	606	627	688	720	19906
		1.4	1.5	2.0	2.0	2.5	2.6	2.8	3.0	3.1	3.5	3.6	100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS

O(CONTINUED)
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FILE OPSCORE (CREATION DATE = 78/10/12.)

O*-*-*-*-*-*-*-*-*-*-CROSS-TABULATION-*-*-*-*-*-*-*-*-*-*

DVAR		SCOR
	COUNT	

SCOL

DVAR		47	48	49	50	51	52	53	54	55	56	57	ROW TOTAL
SQ1 MALE	COUNT	605	718	707	775	697	745	844	722	722	699	592	16695
	ROW PCT	3.6	4.3	4.2	4.6	4.2	4.5	5.1	4.3	4.3	4.2	3.5	83.9
	COL PCT	82.5	85.1	84.0	84.3	83.7	83.1	85.8	82.0	84.3	84.7	85.7	
	TAB PCT	3.0	3.6	3.6	3.9	3.5	3.7	4.2	3.6	3.6	3.5	3.0	
SQ2 FEMALE	COUNT	127	121	132	140	134	148	136	154	131	121	100	3146
	ROW PCT	4.0	3.8	4.2	4.5	4.3	4.7	4.3	4.9	4.2	3.8	3.2	15.8
	COL PCT	17.3	14.3	15.7	15.2	16.1	16.5	13.8	17.5	15.3	14.7	14.5	
	TAB PCT	.6	.6	.7	.7	.7	.7	.7	.8	.7	.6	.5	
SQ3 AMERICAN INDIAN	COUNT	3	11	7	6	5	5	6	7	8	5	6	182
	ROW PCT	1.6	6.0	3.8	3.3	2.7	2.7	3.3	3.8	4.4	2.7	3.3	.9
	COL PCT	.4	1.3	.8	.7	.6	.6	.6	.8	.9	.6	.9	
	TAB PCT	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	
SQ4 BLACK	COUNT	32	45	31	33	31	37	34	16	16	16	12	1398
	ROW PCT	2.3	3.2	2.2	2.4	2.2	2.6	2.4	1.1	1.1	1.1	.9	7.0
	COL PCT	4.4	5.3	3.7	3.6	3.7	4.1	3.5	1.8	1.9	1.9	1.7	
	TAB PCT	.2	.2	.2	.2	.2	.2	.2	.1	.1	.1	.1	
SQ5 WHITE	COUNT	655	740	763	838	756	802	891	820	791	767	657	16973
	ROW PCT	3.9	4.4	4.5	4.9	4.5	4.7	5.2	4.8	4.7	4.5	3.9	85.3
	COL PCT	89.4	87.7	90.6	91.2	90.8	89.4	90.5	93.2	92.4	93.0	95.1	
	TAB PCT	3.3	3.7	3.8	4.2	3.8	4.0	4.5	4.1	4.0	3.9	3.3	
SQ6 SPANISH SURNAMED	COUNT	15	13	6	8	5	10	13	7	4	1	4	481
	ROW PCT	3.1	2.7	1.2	1.7	1.0	2.1	2.7	1.5	.8	.2	.8	2.4
	COL PCT	2.0	1.5	.7	.9	.6	1.1	1.3	.8	.5	.1	.6	
	TAB PCT	.1	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	
SQ7 ORIENTAL	COUNT	2	2	3	4	1	6	2	3	2	5	1	85
	ROW PCT	2.4	2.4	3.5	4.7	1.2	7.1	2.4	3.5	2.4	5.9	1.2	.4
	COL PCT	.3	.2	.4	.4	.1	.7	.2	.3	.2	.6	.1	
	TAB PCT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
COLUMN TOTAL		733	844	842	919	833	897	984	880	856	825	691	19906
		3.7	4.2	4.2	4.6	4.2	4.5	4.9	4.4	4.3	4.1	3.5	100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS

O(CONTINUED)

FILE OPSCORE (CREATION DATE = 78/10/12.)
0* * * * * * * * * * * * CROSSTABULATION * * * * * * * * * * * *
DVAR (TABULATING 1) SPECIAL QUESTIONS
BY SCOR RAW SCORE
* PAGE 11 OF 12

0 SCOR
0 COUNT
ROW PCT
COL PCT
TAB PCT

DVAR	47	48	49	50	51	52	53	54	55	56	57	ROW TOTAL
SQ8	27	28	32	26	31	32	27	26	28	22	17	700
OTHER	3.9	4.0	4.6	3.7	4.4	4.6	3.9	3.7	4.0	3.1	2.4	3.5
	3.7	3.3	3.8	2.8	3.7	3.6	2.7	3.0	3.3	2.7	2.5	
	.1	.1	.2	.1	.2	.2	.1	.1	.1	.1	.1	
SQ9	636	748	755	820	752	816	892	818	796	781	637	17272
H.S. DIPLOMA	3.7	4.3	4.4	4.7	4.4	4.7	5.2	4.7	4.6	4.5	3.7	86.8
	86.8	88.6	89.7	89.2	90.3	91.0	90.7	93.0	93.0	94.7	92.2	
	3.2	3.8	3.8	4.1	3.8	4.1	4.5	4.1	4.0	3.9	3.2	
SQ10	72	63	72	77	62	58	76	45	45	31	42	1624
G.E.D.	4.4	3.9	4.4	4.7	3.8	3.6	4.7	2.8	2.8	1.9	2.6	8.2
	9.8	7.5	8.6	8.4	7.4	6.5	7.7	5.1	5.3	3.8	6.1	
	.4	.3	.4	.4	.3	.3	.4	.2	.2	.2	.2	
SQ11	153	166	163	170	174	176	186	125	150	162	125	3680
3 YRS ARMED FORCES	4.2	4.5	4.4	4.6	4.7	4.8	5.1	3.4	4.1	4.4	3.4	18.5
	20.9	19.7	19.4	18.5	20.9	19.6	18.9	14.2	17.5	19.6	18.1	
	.8	.8	.8	.9	.9	.9	.9	.6	.8	.8	.6	
SQ12	17	15	10	8	11	7	8	6	8	2	4	556
NONE OF SQ9 TO SQ11	3.1	2.7	1.8	1.4	2.0	1.3	1.4	1.1	1.4	.4	.7	2.8
	2.3	1.8	1.2	.9	1.3	.8	.8	.7	.9	.2	.6	
	.1	.1	.1	.0	.1	.0	.0	.0	.0	.0	.0	
COLUMN TOTAL	733	844	842	919	833	897	984	880	856	825	691	19906
	3.7	4.2	4.2	4.6	4.2	4.5	4.9	4.4	4.3	4.1	3.5	100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS
0(CONTINUED)
1

FILE OPSCORE (CREATION DATE = 78/10/12.)
0* * * * * * * * * * * * CROSSTABULATION * * * * * * * * * * * *

DVAR	SCOR	58	59	60	61	62	63	64	65	66	67	68	ROW TOTAL
SQ1 MALE	COUNT	563	536	385	315	239	178	106	57	19	11	4	16695
	ROW PCT	3.4	3.2	2.3	1.9	1.4	.9	.6	.3	.1	.1	.0	83.9
	COL PCT	87.3	85.9	84.8	84.0	86.0	83.2	87.6	87.7	86.4	100.0	80.0	
	TAB PCT	2.8	2.7	1.9	1.6	1.2	.8	.5	.3	.1	.1	.0	
SQ2 FEMALE	COUNT	79	88	68	59	36	32	15	8	3	0	1	3146
	ROW PCT	2.5	2.8	2.2	1.9	1.1	1.0	.5	.3	.1	0	.0	15.8
	COL PCT	12.2	14.1	15.0	15.7	12.9	16.8	12.4	12.3	13.6	0	20.0	
	TAB PCT	.4	.4	.3	.3	.2	.2	.1	.0	.0	0	.0	
SQ3 AMERICAN INDIAN	COUNT	3	1	1	1	1	0	1	1	0	0	0	182
	ROW PCT	1.6	.5	.5	.5	.5	0	.5	.5	0	0	0	.9
	COL PCT	.5	.2	.2	.3	.4	0	.8	1.5	0	0	0	
	TAB PCT	.0	.0	.0	.0	.0	0	.0	.0	0	0	0	
SQ4 BLACK	COUNT	12	8	8	5	2	2	0	0	0	0	0	1398
	ROW PCT	.9	.6	.6	.4	.1	.1	0	0	0	0	0	7.^
	COL PCT	1.9	1.3	1.9	1.3	.7	1.1	0	0	0	0	0	
	TAB PCT	.1	.0	.0	.0	.0	.0	0	0	0	0	0	
SQ5 WHITE	COUNT	604	580	423	356	262	182	113	62	22	10	5	16973
	ROW PCT	3.6	3.4	2.5	2.1	1.5	1.1	.7	.4	.1	.1	.0	85.3
	COL PCT	93.6	92.9	93.2	94.9	94.2	95.8	93.4	95.4	100.0	90.9	100.0	
	TAB PCT	3.0	2.9	2.1	1.8	1.3	.9	.6	.3	.1	.1	.0	
SQ6 SPANISH SURNAMED	COUNT	3	3	2	3	2	0	0	0	0	0	0	481
	ROW PCT	.6	.6	.4	.6	.4	0	0	0	0	0	0	2.4
	COL PCT	.5	.5	.4	.8	.7	0	0	0	0	0	0	
	TAB PCT	.0	.0	.0	.0	.0	0	0	0	0	0	0	
SQ7 ORIENTAL	COUNT	0	2	2	1	1	0	0	0	0	0	0	85
	ROW PCT	0	2.4	2.4	1.2	1.2	0	0	0	0	0	0	.4
	COL PCT	0	.3	.4	.3	.4	0	0	0	0	0	0	
	TAB PCT	0	.0	.0	.0	.0	0	0	0	0	0	0	
COLUMN TOTAL		645	624	454	375	278	190	121	65	22	11	5	19906
		3.2	3.1	2.3	1.9	1.4	1.0	.6	.3	.1	.1	.0	100.0

PERCENTS AND TOTALS BASED ON RESPONDENTS

DVAR (TABULATING 1) SPECIAL QUESTIONS
BY SCOR RAW SCORE

* PAGE 12 OF 12

0
0

DVAR	COUNT / ROW PCT / COL PCT / TAB PCT	SCOR 58	59	60	61	62	63	64	65	66	67	68	ROW TOTAL
SQ8 OTHER		24	29	10	11	6	3	6	2	0	1	0	700
		3.4	4.1	1.4	1.6	.9	.4	.9	.3	0	.1	0	3.5
		3.7	4.6	2.2	2.9	2.2	1.6	5.0	3.1	0	9.1	0	
		.1	.1	.1	.1	.0	.0	.0	.0	0	.0	0	
SQ9 H.S. DIPLOMA		609	600	430	360	264	186	119	64	21	10	5	17272
		3.5	3.5	2.5	2.1	1.5	1.1	.7	.4	.1	.1	.0	86.8
		94.4	96.2	94.7	96.0	95.0	97.9	98.3	98.5	95.5	90.9	100.0	
		3.1	3.0	2.2	1.8	1.3	.9	.6	.3	.1	.1	.0	
SQ10 G.E.D.		28	21	20	10	10	2	2	1	1	1	0	1624
		1.7	1.3	1.2	.6	.6	.1	.1	.1	.1	.1	0	8.2
		4.3	3.4	4.4	2.7	3.6	1.1	1.7	1.5	4.5	9.1	0	
		.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	0	
SQ11 3 YRS ARMED FORCES		122	110	78	68	56	34	18	12	2	1	1	3680
		3.3	3.0	2.1	1.8	1.5	.9	.5	.3	.1	.0	.0	18.5
		18.9	17.6	17.2	18.1	20.1	17.9	14.9	18.5	9.1	9.1	20.0	
		.6	.6	.4	.3	.3	.2	.1	.1	.0	.0	.0	
SQ12 NONE OF SQ9 TO SQ11		0	1	2	1	1	0	1	0	0	0	0	556
		0	.2	.4	.2	.2	0	.2	0	0	0	0	2.8
		0	.2	.4	.3	.4	0	.8	0	0	0	0	
		0	.0	.0	.0	.0	0	.0	0	0	0	0	
COLUMN TOTAL		645	624	454	375	278	190	121	65	22	11	5	19906
		3.2	3.1	2.3	1.9	1.4	1.0	.6	.3	.1	.1	.0	100.0

OPERCENTS AND TOTALS BASED ON RESPONDENTS
0 19906 VALID CASES 561 MISSING CASES
1

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RUN COMPLETED

NUMBER OF CONTROL CARDS READ 30
NUMBER OF ERRORS DETECTED 0

TABLE A6

UNADJUSTED VALIDITY COEFFICIENTS FOR RAW SCORE AND SUBSCORES WITH ACADEMY GRADES

ACADEMY	SUBSCORE 1	SUBSCORE 2	SUBSCORE 3	SUBSCORE 4	SUBSCORE 5	RAW SCORE
Brookline	.1207	.1405	−.1895	−.1242	−.0249	−.0173
Barnstable	−.2488	.7818**	−.0145	.1192	.4871	.1873
Waltham	.5901*	.5376*	.0960	.5285*	.5964*	.7360**
Springfield	.4349**	.5283***	.5274**	.4031**	.3560*	.5352***
S.E. Mass	.4856**	.0649	.1461	.1541	.0714	.3717***
Medford	.4231	.3124	−.0695	.3306	.2815	.4548*
M.D.C.	.3083	.3013	.0461	.1245	.2896	.1873
Boston	.4581***	.4417***	.1946	.4030***	.5812***	.7128***
New Bedford	−.1303	.1561	−.2667	.4598*	.2622	.1831
State	.3820**	.3678*	.0225	.2237	.6141***	.5235***
Worcester	.5082*	.5874**	.2312	.4045	.5194*	.6648***

*p < .05 **p < .01 ***p < .001

TABLE A7

ADJUSTED VALIDITY COEFFICIENTS FOR RAW SCORE AND SUBSCORE WITH ACADEMY GRADES

ACADEMY	SUBSCORE 1	SUBSCORE 2	SUBSCORE 3	SUBSCORE 4	SUBSCORE 5	RAW SCORE
Brookline	.2090	.2439	−.2815	−.2420	−.0251	−.0351
Barnstable	−.3646	.8782***	−.0213	.2159	.7354**	.3891
Waltham	.6461**	.7859***	.1524	.7495**	.5770*	.8317***
Springfield	.5104***	.6842***	.8262***	.5455***	.4771**	.6916***
S.E. Mass	.5886***	.0982	.2501	.2668	.1290	.6245***
Medford	.5044*	.4697*	−.1083	.4388	.5298*	.6945***
M.D.C.	.4721**	.3749*	.0983	.2404	−.4497*	.5485**
Boston	.6206***	.6359***	.3581**	.5631***	.7792***	.9018***
New Bedford	−.2632	.2465	−.4348	.6951***	.4134	.4628*
State	.5012***	.4846***	.0313	.3115*	.7936***	.7203***
Worcester	.6348**	.7808***	.4971*	.4624*	.6660**	.8058***

*p.<.05 **p<.01 ***p<.001

TABLE A8

DESCRIPTIVE STATISTICS FOR MINORITIES FOR THOSE ACADEMIES WITH N≥10

	ACADEMY GRADE			EXAM. SCORE	
ACADEMY	N	MEAN	S.D.	MEAN	S.D.
SPRINGFIELD	11	81.1	5.69	49.18	9.47
M.D.C.	12	91.9	1.88	55.66	2.74
BOSTON	15	85.3	3.49	54.93	3.99
NEW BEDFORD	10	86.9	3.60	55.80	2.66
OVERAL	48	85.54	6.64	53.32	4.82

TABLE A9

UNADJUSTED CORRELATION COEFFICIENTS FOR MINORITIES AND NON-MINORITIES FOR THOSE ACADEMIES WITH N≥10

		MINORITY			NON-MINORITY		
	N	r	P<		N	r	P<
SPRINGFIELD	11	.4720	.071		38	.1480	.188
M.D.C.	12	-.3056	.167		18	.4080	.046
BOSTON	15	.7054	.002		56	.6792	.001
NEW BEDFORD	10	.1637	.326		12	.2895	.181

APPENDIX B

Appendix B

This section contains information descriptive statistics and validity coefficients for total raw score and broken down by subscore. Within each table the following information is ordered by academy:

N:	Number of subjects contributing to the statistics
Exam $\bar{X}$:	Mean IPMA Form A-1 exam score or subscore
Exam s.d.:	Standard deviation of exam scores or subscores
r:	Correlation of academy grade with exam score or subscore - unadjusted, i.e. not corrected for range or restriction
r_c or rcorr:	Correlation of academy grade with exam score or subscore - adjusted (i.e. corrected for range restriction)
Z (r_c):	Fisher's Z conversion of r_c.
Totals	For exam mean and s.d. this refers to computation using total N.
r:	Average of individual r's (each weighted by N-2)
Z (r_c):	Average of individual Z (r_c's) weighted by N-3.
rcorr or r_c:	Conversion of weighted average Z (r_c) into a correlation coefficient.

TABLE B1

SUBSCORE 1

EXAM. POPULATION	
N	20467
$\bar{X}$	15.436
sd.X	3.649

EXAM.	N	$\bar{X}$	s.d.x	r	r corr.	Z(rc)
BROOKLINE	17	18.941	2.076	.1207	.2090	.212
BARNSTABLE	13	19.692	2.394	-.2488	-.3646	-.383
WALTHAM	16	20.063	3.151	.5901*	.6461**	.768**
SPRINGFIELD	45	19.222	2.969	.4349*	.5104**	.563**
S.E. MASS.	51	19.647	2.784	.4856**	.5886**	.677**
MEDFORD	19	18.789	2.917	.4231	.5044*	.556*
M.D.C.	30	18.767	2.208	.3083	.4721**	.513**
BOSTON	64	19.813	2.376	.4581**	.6206**	.727**
NEW BEDFORD	21	17.905	1.758	-.1303	-.2632	-.269
STATE	47	20.000	2.604	.3820**	.5012**	.550**
WORCESTER	20	20.150	2.621	.5082*	.6348**	.750**
TOTALS	343	19.455	2.614	.3674** df=321	.486** df=310	.531

*p<.05
**<.01

TABLE B2

SUBSCORE 2.

EXAM:POPULATION	
N	20467
$\bar{X}$	3.63
$sd._x$	1.262

EXAM.

	N	$\bar{X}$	s.dx	r	r corr.	Z(rc)
BROOKLINE	17	4.412	.712	.1405	.2439	.249
BARNSTABLE	13	4.077	.862	.7818**	.8782**	1.366
WALTHAM	16	4.500	.633	.5376*	.7859**	1.060
SPRINGFIELD	45	4.400	.837	.5283**	.6842**	.836
S.E. MASS.	51	4.216	.832	.0649	.0982	.098
MEDFORD	19	4.053	.780	.3124	.4697*	.510
M.D.C.	30	4.167	.986	.3013	.3749*	.394
BOSTON	64	4.453	.754	.4417**	.6359**	.752
NEW BEDFORD	21	4.286	.784	.1561	.2465	.252
STATE	47	4.404	.901	.3678*	.4846**	.530
WORCESTER	20	4.300	.733	.5874**	.7808**	1.048
TOTALS	343	4.324	.818	.359** df=321	.526** df=310	.584

*p < .05
**p < .01

TABLE B3

SUBSCORE 3

Exam:
N 20467
$\bar{X}$ 5.16
Sd.x 1.415

EXAM

	N	$\bar{X}$	s.d.$_x$	r	r corr.	$\tilde{z}$(rc)
Brookline	17	5.353	.931	-.1895	-.2815	-.289
Barnstable	13	5.615	.961	-.0145	-.0213	-.022
Waltham	16	5.63	.885	.0960	.1524	.153
Springfield	45	5.778	.599	.5274**	.8262**	1.178
S.E. Mass	51	5.529	.809	.1461	.2501	.255
Medford	19	5.474	.905	-.0695	-.1083	-.109
M.D.C.	30	5.667	.661	.0461	.0983	.099
Boston	64	5.687	.732	.1946	.3581**	.375
New Bedford	21	5.429	.811	-.2667	-.4348	-.466
State	47	5.553	1.017	.0225	.0313	.032
Worcester	20	5.650	.587	.2312	.4971*	.545
TOTAL	343	5.603	.799	.126*	.269**	.276
				df=321	df=310	

*p < .05
**p < .01

TABLE B4

SUBSCORE 4

Exam:

N	20467
$\bar{X}$	9.77
sd.X	2.728

EXAM

	N	X	$s.d._x$	r	r corr.	$\tilde{z}(r_c)$
Brookline	17	12.000	1.369	−.1242	−.2420	−.247
Barnstable	13	12.769	1.487	.1192	.2159	.219
Waltham	16	12.125	1.500	.5285*	.7495**	.973
Springfield	45	11.844	1.846	.4031**	.5455**	.612
S.E. Mass	51	11.608	1.537	.1541	.2668	.273
Medford	19	11.947	1.957	.3306	.4388	.470
M.D.C.	30	11.567	1.382	.1245	.2404	.245
Boston	64	11.859	1.763	.4030**	.5631**	.638
New Bedford	21	11.333	1.461	.4598*	.6951**	.858
State	47	12.213	1.910	.2237	.3115*	.323
Worcester	20	11.750	2.314	.4045	.4624*	.500
TOTAL	343	11.863	1.727	.286**	.445**	.478

*p < .05
**p < .01

df=321 df=310

TABLE B5

SUBSCORE 5

Exam:

N	20467
$\bar{X}$	13.34
sd.X	3.641

EXAM

	N	X	$s.d._x$	r ·	r corr.	$\frac{1}{2}(r_c)$
Brookline	17	15.765	3.615	−.0249	−.0251	−.0251
Barnstable	13	17.000	1.871	.4871	.7354	.941
Waltham	16	15.563	3.829	.5964*	.5770*	.657
Springfield	45	15.556	2.555	.3560*	.4771**	.519
S.E. Mass	51	15.902	2.003	.0714	.1290	.130
Medford	19	16.579	1.710	.2815	.5298*	.590
M.D.C.	30	15.200	2.188	−.2896	−.4497*	−.485
Boston	64	16.312	2.092	.5812**	.7792**	1.043
New Bedford	21	15.381	2.179	.2622	.4134	.440
State	47	17.021	2.172	.6141**	.7936**	1.082
Worcester	20	16.400	2.479	.5194*	.6660**	.804
TOTAL	343	16.079	2.401	=.333**	.511**	.5639
				df=321	df=310	df=310

*p < .05
**p < .01

TABLE B6

RAW SCORE

Exam:

N 20467

$\bar{X}$ 47.34

s.d.X 10.038

EXAM

	N	X	$s.d._x$	r	r corr.	$\frac{1}{2}(rc)$
Brookline	17	56.471	4.951	−.0173	−.0351	−.035
Barnstable	14	58.929	4.531	.1873	.3891	.411
Waltham	16	57.875	7.284	.7360**	.8317**	1.194
Springfield	49	57.122	6.642	.5352**	.6916**	.852
S.E. Mass	64	56.203	5.027	.3717**	.6245**	.733
Medford	20	56.900	5.310	.4548*	.6945**	.858
M.D.C.	30	55.367	2.918	.1873	.5485**	.617
Boston	71	57.901	4.888	.7128**	.9018**	1.483
New Bedford	22	54.409	3.581	.1831	.4628*	.501
State	47	59.191	5.940	.5235**	.7203**	.909
Worcester	26	57.923	6.566	.6648**	.8058**	1.115
TOTAL	376	57.186	5.470	.4905**	.719**	.9059
				df= 354	df= 343	df= 343

*p < .05

**p < .01